Swami Ramanand Teerth Marathwada University, Nanded

-: Name of the Research Topic :-

"Synthesis, Charecterization of Europium Based thin Films by Chemical role"

Faculty of Science in the subject Physics

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Synthesis, Characterization of Europium Based thin Films by Chemical Role

Abstract :

Various deposition techniques have been used for thin film formation, like chemical vapour deposition, molecular beam epitaxy radio frequency magnetron sputtering, spray pyrolysis and successive ionic layer adsorption and reaction (SILAR) etc.

The SILAR method is relatively new, experimentally simple and economical. So this method is preferred for deposition of nano-crystaline Europium chalogenide based thin films. Thin films produced are characterized by using different character lization technique such as TEP, SEM, TEM, EDAX, XRD, UV, IR, PEC, Super conducto, etc.

It is also planed to study the applications of Eu thin film to society (Solar cell preparation and super capacitor designing, etc.)

Introduction :

Thin film science is a relatively young and ever growing field in science and technology, which is confluence of material science, surface science and applied physics and has became an intentifible unified discipline of science endover. The studies on the thin film formation are being pursued with increasing interest on account of its proven and potential applications in variety of semiconductor devices.

In the field of materials research one is often confronted with problems of materials preparation and in order to reduce cost of a relatively simple method is needed to be able to asses quickly the various physic-chemical properties of the materials. The deposition material properties enhance the importance and utility of thin films in economic way.

Various deposition techniques have been applied to produce thin films, including molecular, beam epitaxy radio frequency magnetron sputtering metal organic chemical vapour deposition, spray pyrolysis technique, chemical both deposition successive ionic adsorption and reaction (SILAR). For preparation and deposition of then films on different substrates by chemical techniques have been studied commonly because those techniques facilitate the designing of the materials on molecular level.

SILAR method can be used to prepare thin films successive ionic layer adsorption and reaction (SILAR) is a new method for deposition of metal chalcognides thin films. SILAR is an inexpensive and conversional for large area deposition. The quality and thickness of the films depends on preparative parameters, does not required sophisticate instruments, comparatively low temperature process to aviode diffusion and having easily controllable parameters as such pH of the solution temperature mersion cycles, time solution concentration film formation and growth of the films etc. SILAR is based on immersion of the substrates onto separates placed anionic and cationic precursors one rinsing between every immersion with ion exchange water. The substrate may be a glass, quantz or diamonds etc.

When substrate is immersed in cationic precurson, cations are resorbed on the substrate surface. The unabsorbed or excess ions can be separated out by rinsing the substrate in DDW to avoid homogenous precipitation. After this substrate is immersed in anionic precursor solution the an ions get reacted with preabsorbed cations. Rinsing the substrate again DDW can be S4 separate out the unreacted material. These steps may formed as one SILAR cycles. After subsequent SILAR cycles multilayer films deposited on the substrate with appropriate film thickness.

Literature Survey :

- B.R. Sankpal etal (1999, 2000 and 2002) Studied thin film deposition by SILAR method and the different characterizations like SEM, EDAX, TEM, SEM, XRD etc. Sb_2S_3, Bi_2Se_3 and SnS_2 and thin film have been reported.

- C.D. Lokhande etal (2000 and 2001) has been reported (X-RD), SEM, AFM, HRTEM, energy dispersive X-ray analysis (EDAX), optical absorption and electrical measurement technique for Bi_2Se_3; Sb_2Se_3, Bi_2Se_3-Sb_2Se_3 and Cds thin film.

- H.M. Pathan etal (2002) have been also reported different characterization for 'CdSe' thin film also measure the optical band gap is found to be 1.80 eV and electrical Resistivity is in the order of 10^4 Ω cm.

- S.J. Patil 2015 has been reported electrochemical tests for La_2Se_3, which shows that La2Se3 electrode exhibit a maximum specific capacitance of 339 Fg^{-1} in the 1.0 V/SCE and 363 F g^{-1} at 1.3 V/SCE. It suggests that La_2Se_3 have high performance super capacitor applications. It is also reported thickness measurement study, XRD, F.T. Ramman spectroscopy, SEM, AFM and contacting angle measurement study.

It is found from literature survey, there is no work on Eu chalcogenide thin film by (SILAR) technique.

We plan to prepare Eu chalcogenide thin film by SILAR Method and its different characters has to be characterized.

Objective of Research :

It is planed to deposite a Eu chalcogenide thin film on non conducting substrate like glass by SILAR Method of the different characterizations such as electrical resistivity, TEP, SEM, TEM, EPAX, SRD, RR, PEC, etc. for prepared thin film.

Methodology to be Adopted :

The Eu chalkogenide nanocrystaline thin films are to be deposited by using (SILAR) successive ionic layer adsorption and reaction method.

The water soluble Europium and selenide are mixed chemically to form europium chalkogenide aqueous solution. All chemicals are of AR or spectroscopic grade and are used without further purification. The films are deposited for different concentrations at "different temperature".

The optical, physical and electrical properties of deposited thin films are to be studied.

Importance of study / society applications :

Eu chalkogenide thin film study is most important because of its electrical, chemical, optical and structural properties which are useful for super capacitor designing, solar cell and energy conservation devices, etc.

National & International –

- S.J. Patil 2015 has been reported electro chemical properties for La_2Se_3 in the designing of super capacitor with capacities 339 F g^{-1} at 1.0 V/SCE and 363 F g^{-1} at 1.3 V/SCE.
- B.R. Sankpal et al (2004) reported that CuI and CuSCN thin films are deposited at room temperature using SILAR and CBD methods. The preparative parameters were optimized with the aim to use these materials as window layer for solar cell. Structural surface morphological and optical studies are also reported.

As nano crystalline thin films are widely used to increase life and efficiency of solar cell. To develop and design highly efficieny non conventional energy devices is the present need of nation.

The main problem of energystorage is diluted by designing super capacitor using nanocrystaline thin film.

Proposed work plan / formation and structure of study :

- 2016-17

  The literature survey related to Eu chalcognide thin film has to be taken. SILAR Technique is designed and studied for Eu Chalcoginide thin film.

- 2017-18

  Eu chalcogenide nanocrystaline thin film has to be prepared by successive ionic layer adsorption and reaction (SILAR) technique and their characterization such as electrical resistivity, TEP, SEM, TEM, SPAX, SRD, IR, PEC, UV, Superconducto, etc. proposed to be taken.

- 2018-19

  Plan to analyze the prepared thin film.

  - Result and discussion for proposed plan work has to be discusted.
  - Preparation of final draft (Thesis) for proposed work.

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